AMENDMENTS TO CLAIMS

1. (Currently amended) An image sensor, comprising:

a plurality of active pixel sensors arranged in a plurality of rows and at least one column, each active pixel sensor including

a photosensor configured to generate a sensor signal nominally indicative of an intensity of light incident on the photosensor;

a follower-type amplifier configured to provide a buffered voltage sensor signal based on the sensor signal; and

sensor output selection circuitry configured to selectively couple the buffered voltage sensor signal to an output of the active pixel sensor when the row to which the active pixel sensor belongs is selected based on one of a set of row select signals corresponding to that row;

for each column, a column line coupling together the outputs of the active pixel sensors that belong to that column; and

row select signal generating circuitry configured to generate the set of row select signals to substantially simultaneously select a corresponding set of plural particular rows such that each of the active pixel sensors in the selected corresponding set of plural particular rows substantially simultaneously provides the buffered voltage sensor signal for that active pixel sensor to the column line for the column to which that active pixel sensor belongs such that an output node of each column line indicates a collective output signal for the active pixel sensors in that selected corresponding set of plural particular rows, belonging to that column.

2. (Original) The image sensor of claim 1, wherein:

the follower-type amplifier includes a field-effect transistor configured as a source-follower amplifier.

3. (Original) The image sensor of claim 2, wherein:

the sensor output selection circuitry includes a field-effect transistor, wherein the gate of the sensor output selection circuitry field-effect transistor is coupled to the one of the set of row select signals; and

the source-follower amplifier field-effect transistor and the sensor output selection circuitry field-effect transistor each have the same conductivity type.

4. (Original) The image sensor of claim 1, wherein:

the follower-type amplifier includes a bipolar transistor configured as an emitter-follower amplifier.

5. (Original) The image sensor of claim 1, wherein:

the row select signal generating circuitry generates the set of row select signals based on a row address signal that corresponds to a particular row and on a row aggregation control signal that corresponds to a number of rows in the selected corresponding set of plural particular rows.

6. (Original) The image sensor of claim 5, further comprising:

row address signal generating circuitry that generates the row address signal.

7. (Original) The image sensor of claim 6, wherein:

the row address signal generating circuitry generates the row address signal based, in part, on the row aggregation control signal.

8. (Original) The image sensor of claim 1, wherein:

the set of row select signals is one set of row select signals in a sequence of sets of row select signals;

the selected corresponding set of plural particular rows is one set of plural particular rows in a sequence of sets of plural particular rows; and

the row select signal generating circuitry is configured to generate the sequence of sets of row select signals.

9. (Original) The image sensor of claim 8, wherein:

the row select signal generating circuitry generates the set of row select signals based on a row address signal that corresponds to a particular row;

the row address signal is one row address signal in a sequence of row address signals;

the image sensor further comprises row address signal generating circuitry that generates the sequence of row address signals, each row address signal corresponding to a particular row; and

the row select signal generating circuitry generates the sequence of sets of row select signals based on the sequence of row address signals and on a row aggregation control signal that corresponds to a number of rows in each selected corresponding set of plural particular rows.

10. (Original) The image sensor of claim 9, wherein:

the row address signal generating circuitry generates each next row address signal in the sequence based, in part, on the current row address signal.

11. (Original) The image sensor of claim 9, wherein:

the row address signal generating circuitry generates each next row address signal in the sequence based on the current row address signal and on the row aggregation control signal.

12. (Original) The image sensor of claim 1, further comprising:

column select signal generating circuitry configured to generate a set of column select signals to substantially simultaneously select a corresponding set of plural particular columns such that the collective output signal for each column in the selected

corresponding set of plural particular columns is substantially simultaneously provided to an output node of the image sensor.

13. (Original) The image sensor of claim 12, wherein:

the column select signal generating circuitry generates the set of column select signals based on a column address signal that corresponds to a particular column and on a column aggregation control signal that corresponds to a number of columns in the set of plural particular columns.

14. (Original) The image sensor of claim 13, further comprising:

column address signal generating circuitry that generates the column address signal.

15. (Original) The image sensor of claim 14, wherein:

the column address signal generating circuitry generates the column address signal based, in part, on the column aggregation control signal.

16. (Original) The image sensor of claim 13, wherein:

the set of column select signals is one set of column select signals in a sequence of sets of column select signals;

the set of plural particular columns is one set of plural particular columns in a sequence of sets of plural particular columns; and

the column select signal generating circuitry is configured to generate the sequence of sets of column select signals.

17. (Original) The image sensor of claim 16, wherein:

the column address signal is one column address signal in a sequence of column address signals;

the image sensor further comprises column address signal generating circuitry that generates the sequence of column address signals, each column address signal corresponding to a particular column; and

the column select signal generating circuitry generates the sequence of sets of column select signals based on the sequence of column address signals and on a column aggregation control signal that corresponds to a number of columns in each selected corresponding set of plural particular columns.

18. (Original) The image sensor of claim 17, wherein:

the column address signal generating circuitry generates each next column address signal in the sequence based, in part, on the current column address signal.

19. (Original) The image sensor of claim 17, wherein:

the column address signal generating circuitry generates each next column address signal in the sequence based on the current column address signal and on the column aggregation signal.

20. (Currently amended) An image sensor, comprising:

a plurality of active pixel sensors arranged into a plurality of rows and a plurality of columns, each active pixel sensor including

a photosensor configured to generate a sensor signal nominally indicative of an intensity of light incident on the photosensor;

a follower-type amplifier configured to provide a buffered voltage sensor signal based on the sensor signal; and

sensor output selection circuitry configured to selectively couple the buffered voltage sensor signal to an output of the active pixel sensor when the row to which the active pixel sensor belongs is selected based on one of a set of row select signals corresponding to that row;

for each column, a column line coupling together the outputs of the active pixel sensors that belong to that column and terminating in a column node for that column;

row select signal generating circuitry configured to generate the set of row select signals to select a corresponding set of plural particular rows such that each active pixel sensor in the selected corresponding set of particular rows provides the buffered voltage sensor signal for that active pixel sensor to the column line for the column to which that active pixel sensor belongs; and

column select signal generating circuitry configured to generate a set of column select signals to substantially simultaneously select a corresponding set of plural particular columns such that the column node for each column in the selected corresponding set of plural particular columns is substantially simultaneously coupled to an output node of the image sensor.

21. (Original) The image sensor of claim 20, wherein:

the column select signal generating circuitry generates the column select signals based on a column address signal that corresponds to a particular column and on a column aggregation control signal that corresponds to a number of columns in the selected corresponding set of plural particular columns.

22. (Original) The image sensor of claim 21, further comprising:

column address signal generating circuitry that generates the column address signal.

23. (Original) The image sensor of claim 22, wherein:

the column address signal generating circuitry generates the column address signal based, in part, on the column aggregation control signal.

24. (Original) The image sensor of claim 21, wherein:

the set of column select signals is one set of column select signals in a sequence of sets of column select signals;

the set of plural particular columns is one set of plural particular columns in a sequence of sets of plural particular columns; and

the column select signal generating circuitry is configured to generate the sequence of sets of column select signals.

25. (Original) The image sensor of claim 24, wherein:

the column select signal generating circuitry generates the column select signals based on a column address signal that corresponds to a particular column;

the column address signal is one column address signal in a sequence of column address signals;

the image sensor further comprises column address signal generating circuitry that generates the sequence of column address signals, each column address signal corresponding to a particular column; and

the column select signal generating circuitry generates the sequence of sets of column select signals based on the sequence of column address signals and on a column aggregation control signal that corresponds to a number of columns in each selected corresponding set of plural particular columns.

26. (Original) The image sensor of claim 25, wherein:

the column address signal generating circuitry generates each next column address signal in the sequence based, in part, on the current column address signal.

27. (Original) The image sensor of claim 25, wherein:

the column address signal generating circuitry generates the each next column address signal in the sequence based on the current column address signal and on the column aggregation signal.

28. (Currently amended) A method of controlling a group of active pixel sensors comprising:

for each of a plurality of particular subgroups of the group of active pixel sensors, controlling the collection of active pixel sensors such that buffered voltage sensor signals of the active pixel sensors of the particular subgroup are substantially simultaneously coupled to an output node to provide a collective output signal for the particular subgroup; and

recording, at the output node, an indication of the collective output signal.

29. (Currently amended) An image sensor, comprising:

a collection of active pixel sensors configured to generate buffered voltage sensor signal outputs;

circuitry to control the collection of active pixel sensors such that, for each of a plurality of particular subgroups of the group of active pixel sensors, the buffered voltage sensor signal outputs of the active pixel sensors of the particular subgroup are substantially simultaneously coupled to an output node of an image sensor to provide a collective output signal for the particular subgroup.

30. (Currently amended) A camera, comprising:

an image sensor that includes

a plurality of active pixel sensors arranged in a plurality of rows and a plurality of columns, each active pixel sensor including:

a photosensor configured to generate a sensor signal nominally indicative of an intensity of light incident on the photosensor;

a follower-type amplifier configured to provide a buffered voltage sensor signal based on the sensor signal; and

sensor output selection circuitry configured to selectively couple the buffered voltage sensor signal to an output of the active pixel sensor when the row to

which the active pixel sensor belongs is selected based on a row select signal corresponding to that row;

for each column, a column line coupling together the outputs of the active pixel sensors that belong to that column;

row select signal generating circuitry configured to generate the row select signals to substantially simultaneously select a set of plural particular rows such that each of the active pixel sensors in the selected set of plural particular rows substantially simultaneously provides the buffered voltage sensor signal for that active pixel sensor to the column line for the column to which that active pixel sensor belongs, such that an output node of each column line indicates a collective output signal for the active pixel sensors in the selected set of plural particular rows, belonging to that column;

column select signal generating circuitry configured to generate column select signals to substantially simultaneously select a set of columns such that the collective output signal for each column in the selected set of columns is substantially simultaneously provided to an output node of the image sensor;

a controller configured to control the row select signal generating circuitry and the column select signal generating circuitry; and

a memory configured to store signals provided at the output node of the image sensor.

31. (Original) The camera of claim 30, and further comprising:

a display device configured to display an image corresponding to the signals stored in the memory.

32. (Original) The camera of claim 30, wherein:

the follower-type amplifier includes a field-effect transistor configured as a source-follower amplifier.

33. (Original) The camera of claim 32, wherein:

the sensor output selection circuitry includes a field-effect transistor, wherein the gate of the sensor output selection circuitry field-effect transistor is coupled to the one of the set of row select signals; and

the source-follower amplifier field-effect transistor and the sensor output selection circuitry field-effect transistor each have the same conductivity type.

34. (Original) The camera of claim 30, wherein:

the follower-type amplifier includes a bipolar transistor configured as an emitter-follower amplifier.

35. (Original) The camera of claim 30, wherein:

the row select signal generating circuitry generates the set of row select signals based on a row address signal that corresponds to a particular row and on a row aggregation control signal that corresponds to a number of rows in the selected corresponding set of plural particular rows.

36. (Original) The camera of claim 35, further comprising:

row address signal generating circuitry that generates the row address signal.

37. (Original) The camera of claim 36, wherein:

the row address signal generating circuitry generates the row address signal based, in part, on the row aggregation control signal.

REMARKS

Applicant has submitted a proposed drawing change to Figures 1A and 1B, designating the Figures with the legend --Prior Art--.

The Examiner rejected claims 1-37 under 35 U.S.C. 102(e) as being anticipated by Yoneyama. Yoneyama discloses aggregating pixel sensor output signals by summing the currents out of active pixel amplifiers that are configured as voltage-to-current converters.

Claim 1 has been amended to recite, in part:

a follower-type amplifier configured to provide a buffered voltage sensor signal based on the sensor signal; and

sensor output selection circuitry configured to selectively couple the buffered voltage sensor signal to an output of the active pixel sensor when the row to which the active pixel sensor belongs is selected based on one of a set of row select signals corresponding to that row;

for each column, a column line coupling together the outputs of the active pixel sensors that belong to that column; and

row select signal generating circuitry configured to generate the set of row select signals to substantially simultaneously select a corresponding set of plural particular rows such that each of the active pixel sensors in the selected corresponding set of plural

particular rows substantially simultaneously provides the buffered voltage sensor signal for that active pixel sensor to the column line for the column to which that active pixel sensor belongs such that an output node of each column line indicates a collective output signal for the active pixel sensors in that selected corresponding set of plural particular rows, belonging to that column.

The threshold issue under section 102 is if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. MPEP 2131. Yoneyama discloses an amplifying device, including a Junction-Gate Field Effect Transistor, from which a readout signal is read out in the form of a current signal. The current signal flow is converted into a voltage signal by a current voltage conversion signal. Col. 8 line 49 and col. 12 lines 19-35. Yoneyama fails to disclose a follower-type amplifier configured to provide a buffered voltage sensor signal based on the sensor signal.

First, Yoneyama operates amplifying device QA as a voltage-to-current converter. The signal charge that is photoelectrically converted by photodiode PD and stored is sent to the gate of amplifying device QA and the gate voltage of the amplifying device QA reaches a voltage that corresponds to the image signal. Horizontal readout switch QH turns on and amplifying devices QA of the selected picture elements are operated and the *signal current that corresponds to the image signal flows*. The signal current is

converted into a voltage signal by current conversion circuit 9 and image output voltage signal Vout is obtained. Col. 10 lines 28-44. Necessarily amplifier QA in Yoneyama, a current-to-voltage converter, is not a follower-type amplifier.

Second, amplifier QA in Yoneyama fails to provide a buffered voltage sensor signal, rather it is providing a current that is later converted into the voltage signal Vout.

Claim 1 is in condition for allowance. Claims 2-19 depend from claim 1 and are also in condition for allowance.

Claim 20 has been amended in a manner similar to the amendment of claim 1. Although claims 1 and 20 are not identical, the same argument for claim 1 applies to claim 20 as well. Claim 20 is in condition for allowance. Claims 21-27 depend from claim 20 and are in condition for allowance as well.

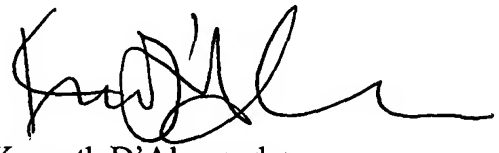
Claims 28, 29 and 30 have been amended in a manner similar to the amendment of claim 1. Although claims 1 and 28, 29, and 30 are not identical, the same argument for claim 1 applies to claims 28, 29 and 30 as well. Claims 28, 29, and 30 are in condition for allowance. Claims 31-37 depend from claim 30 and are in condition for allowance as well.

Applicant respectfully requests that the Examiner allow all the claims and direct the application to issue.

In view of the foregoing, consideration and an early allowance of this application are earnestly solicited.

Respectfully submitted,
Sierra Patent Group, Ltd.

Dated: June 27, 2003



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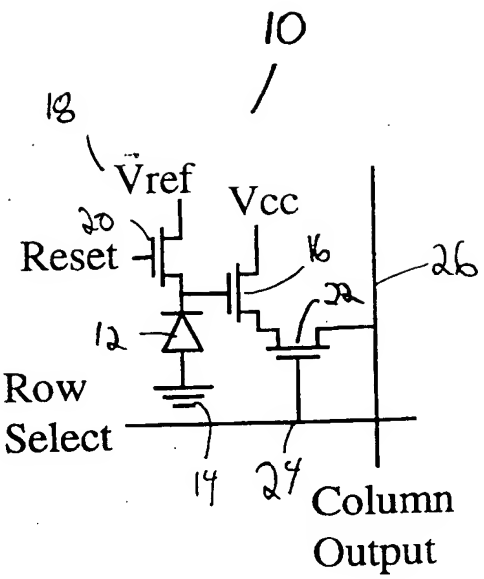

FIG. 1A
PRIOR ART

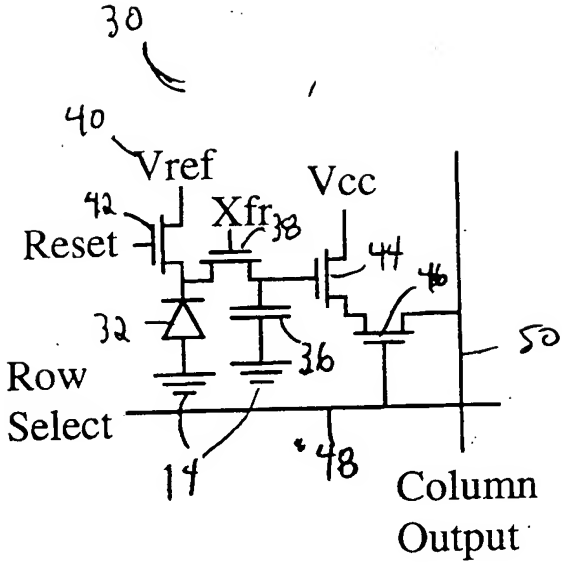

FIG. 1B
PRIOR ART

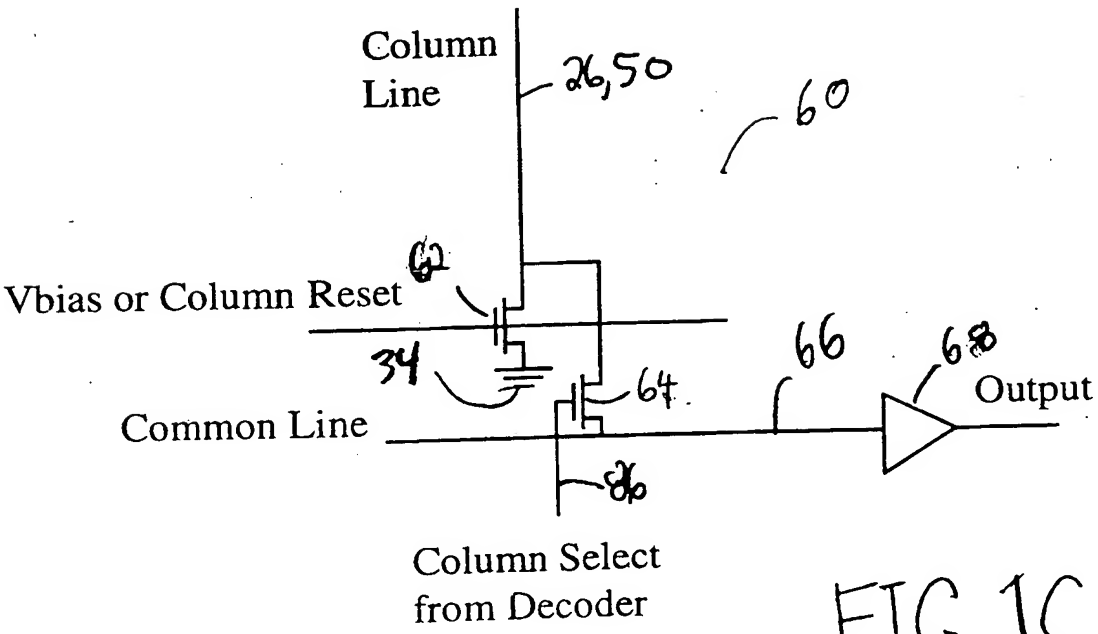

FIG. 1C